MEMORANDUM FOR: All NWS Regional Headquarters, Regional Maintenance Specialists, Electronic Systems Analysts, and Electronics Technicians [Engineering Handbook (EHB)-9 distribution]

FROM: W/OPS1 - John McNulty

SUBJECT: Transmittal Memorandum for EHB-9 Issuance 01-07

1. Material Transmitted:

Engineering Handbook No. 9 (EHB-9), Automatic Radiotheodolite (ART)-1/2, Section 2.4, to ART-1/2 Maintenance Note 20, Rev A, ART-1/2 Tracking Alignment.

2. Summary:

Changes to paragraphs 1.1.2 c, d, h, and i.

3. Effect on Other Instructions:

These instructions supersede the tracking alignment found in the ART-1/2 blue factory manuals. Make pen and ink changes to the Instruction Manual Number 9-601 (ART-1, 1R Maintenance) and 9-701 (ART-2, 2R Maintenance), Volume 1, pages 5-33, paragraph 5.2.4.3. Enter the following notation: *"Refer to Maintenance Note 20, Rev A, for ART-1/2 Tracking Alignment procedure."*

ART-1/2 MAINTENANCE NOTE 20, Rev A, (for Electronics Technicians)
Maintenance, Logistics, and Acquisition Division
W/OPS12: FJZ

SUBJECT	:	Automatic Radiotheodolite (ART)-1/2 Tracking Alignment
PURPOSE	:	To provide ART-1/2 tracking alignment procedures
EQUIPMENT AFFECTED	:	All ART-1 and ART-2
PARTS REQUIRED	:	None.
SPECIAL TOOLS REQUIRED	:	Type — Manufacturer Model (or equivalent) Signal Generator — Marconi 2024 Digital Voltmeter (DVM) — Fluke 8050A Oscilloscope — Tektronics 465
MODIFICATION PROCUREMENT	:	None.
SITES AFFECTED	:	All ART-1 and ART-2 sites
ESTIMATED TIME REQUIRED	:	2 Hours
EFFECT ON OTHER INSTRUCTIONS	:	Make pen and ink changes to the Instruction Manual Number 9-601 (ART-1, 1R Maintenance) and 9-701 (ART-2, 2R Maintenance), Volume 1, page 5-33, paragraph 5.2.4.3. Enter the following notation: *Refer to Maintenance Note 20, Rev A, for ART-1/2 Tracking Alignment procedure.*
AUTHORIZATION	:	N/A
VERIFICATION STATEMENT	:	This procedure was tested at the National Weather Service Training Center.
TECHNICAL ASSISTANCE	:	For questions or problems pertaining to this alignment, please contact Franz J. G. Zichy at 301-713-1833, x128.

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GENERAL:

This maintenance note provides a revised ART-1/2 tracking alignment procedure for use with the new Marconi 2024 Signal Generator.

PROCEDURE:

1 Tracking Alignment

This tracking alignment procedure is written for field-level alignment and is applicable for periodic maintenance, performance verification, and particularly after replacing the following subassemblies.

Reference Designation	Description
1A3A1A1A2	AZ/EL Amplifier
1A3A1A1A3	EL Phase Comparator
1A3A1A1A4	AZ Phase Comparator
1A3A1A1A5	Video Amplifier
1A3A1A1A7	AFC/AGC Detector
1A3A1A1A14	Simulator Analog

NOTE: Before proceeding, perform the Marconi signal generator memory configurations as described in attachment A.

CAUTION

A receiver alignment must be performed before proceeding with the tracking alignment.

Parts of the tracking alignment must also be performed after any one of the following pedestal components are replaced:

a. Any part of the pylon [requires reference generator phasing (starts in section 1.7)].

b. Azimuth or elevation tachometers (ART-2 only).

c. Motor (ART-1) or clutches (ART-2) [requires idle current balancing adjustment (section 1.3.4 or 1.4.4)].

1.1 Tracking Alignment Procedure

To preserve continuity of setup and proper sequence of adjustments and measurements, perform (or verify) the following steps in the exact order given.

1.1.1 Initial Setup

a. Energize the System using normal start up procedures (refer to instruction manual *Automatic Radiotheodolite ART-1/ART-2 Maintenance* Vol. 1, Section 3.3.1.6). Verify the following switches on the receiver/antenna control unit (R/ACU).

Switch	Setting or Indication
AGC/MGC	extinguished (AGC Mode)
LIMITED SEARCH MODE	illuminated
MANUAL TRACK MODE	illuminated
LOW SENSITIVITY	extinguished
Test Selector	EL ERROR
STANDBY	extinguished
SIMULATOR POWER	ON

b. Manually slew the antenna assembly in elevation and azimuth to a convenient position for unencumbered access and work space.

c. Unfasten and slide out the R/ACU. Access to internal connections on circuit card assemblies may be gained by use of the extender circuit card assembly A11.

CAUTION

Do not remove or insert circuit card assemblies with power applied. To remove or insert circuit cards, perform the following steps:

(1) Position the SYSTEM POWER switch to the OFF position.

(2) Remove/insert the circuit card.

(3) Position the SYSTEM POWER switch to the ON position.

(4) Verify or reset front panel controls as necessary.

NOTE: Unless otherwise stated, work area is at the R/ACU (1A3A1). Any mention of reference designators are assumed to be preceded by "1A3A1."

1.1.2 Simulator Analog Balance Adjustment (A14R11 and A14R37)

a. Position R/ACU SYSTEM POWER switch to ON. Press MANUAL TRACK MODE to illuminate. Press STANDBY to extinguish.

b. Position SIMULATOR/OFF switch to OFF then to SIMULATOR.

c. With an oscilloscope, check A14TP5 (EL) or A14TP8 (AZ). If no 30 or 34 Hz sine waves are present, no further balance adjustment is required. If present, perform steps d through j.

d. If 30 or 34 Hz sine waves are present at A14TP5 (EL) or A14TP8 (AZ), position R/ACU SYSTEM POWER switch to OFF.

e. Place the Simulator Analog circuit card assembly (A14) on extender circuit card assembly A11.

f. Position R/ACU SYSTEM POWER switch to ON. Press MANUAL TRACK MODE to illuminate. Press STANDBY to extinguish.

g. Position SIMULATOR/OFF switch to OFF, then to SIMULATOR.

h. Connect the DVM and oscilloscope to A14TP5 (EL), and then adjust A14R11 to obtain a minimum signal level (mvAC).

i. Connect the DVM and oscilloscope to A14TP8 (AZ), and adjust A14R37 for a minimum 30 or 34 Hz signal.

j. Position R/ACU SYSTEM POWER switch to OFF, and place the simulator analog circuit card assembly A14 into its nested position.

1.1.3 Servo Drive Ramp Adjustment (A7R97)

a. Position R/ACU SYSTEM POWER switch to OFF.

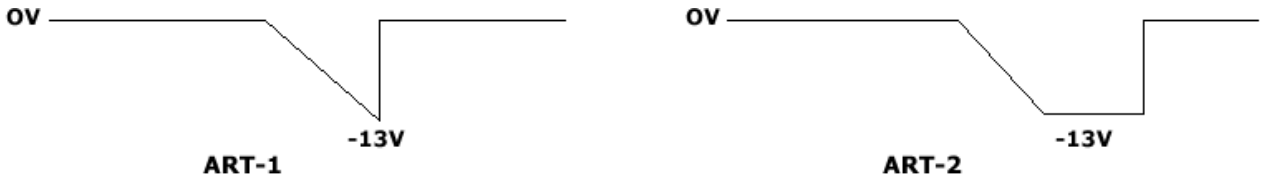
b. Place the AFC/AGC Detector circuit card assembly A7 on the extender circuit card assembly A11.

c. Position R/ACU SYSTEM POWER switch to ON. Press to illuminate STANDBY and MANUAL TRACK MODE.

d. Connect the oscilloscope to A7TP10. Set the oscilloscope controls for direct current (DC) input and adjust the vertical gain and sweep speed to display 2 to 3 cycles of the 120 Hz sawtooth waveform.

e. Adjust A7R97 for a saturated negative peak (approximately -13 V). The width of the negative saturated peak should be 2 1/4 ms. for the ART-2 and a saturated waveform for ART-1.

NOTE:	Saturation or flattening of the positive peaks at the 0 Vdc level is normal.



f. Position the SYSTEM POWER switch to OFF, and place the AFC/AGC detector circuit card assembly A7 into its nested position.

1.2 Azimuth Alignment

1.2.1 Azimuth Static Alignment

a. Raise the azimuth phase comparator circuit card assembly A4 on the extender circuit card assembly A11.

b. Position the SYSTEM POWER switch to ON.

c. Repeat the Initial Setup procedure, section 1.1.1.

1.2.2 Azimuth Tachometer Phase Null (A4R45) [ART-2 only]

a. Connect the oscilloscope to A4TP10.

b. While slewing the antenna assembly in the azimuth axis, clockwise and then counter-clockwise, adjust A4R45 until the best half-wave rectified waveform is obtained.

1.2.3 Azimuth Tachometer Null (A4R37) [ART-2 only]

a. Slew the antenna assembly in elevation to at least 45 degrees.

b. Press to illuminate STANDBY. Verify the motor stopped running. At the R/ACU, position the SYSTEM POWER switch to OFF.

*****WARNING*****

The Grey wire removed in the next step carries 115 VAC. To prevent bodily injury, ensure the SYSTEM POWER switch is in the OFF position before disconnecting the wire.

c. Remove the rear pedestal cover. At the azimuth drive assembly, carefully remove the grey wire from terminal 7. Cover the lead with tape to prevent it from shorting to ground.

d. At the R/ACU, position the SYSTEM POWER switch to ON. Press to extinguish STANDBY. Observe that only the elevation motor is running.

e. Connect the oscilloscope between A4-AA (ART2-TAC on test panel) and ground. Adjust A4R37 for a minimum 60 Hz signal (0.15 V p-p typical).

f. Connect the oscilloscope and DVM between A4TP10 and ground.

g. Adjust the Azimuth Tachometer core for a null on the oscilloscope.

h. Readjust A4R37 for the best null on the oscilloscope. Then readjust A4R37 to obtain 0 Vdc on the DVM.

i. Press to illuminate STANDBY. Verify the elevation motor stopped running. At the R/ACU, position the SYSTEM POWER switch to OFF.

j. At the azimuth drive assembly, carefully secure the grey wire (removed in step c) to terminal 7. Install the rear pedestal cover.

k. At R/ACU, position the SYSTEM POWER switch to ON. Press to extinguish STANDBY. Verify that both drive motors are running.

1.2.4 Azimuth Drive Current Idle Balance (A2R59 and A2R62)

a. Verify the MANUAL TRACK MODE is illuminated and the STANDBY is extinguished.

b. Position the test selector switch to AZ DRIVE. Alternately position the auxiliary test switch between UP/CW and DN/CCW while observing the SERVICE METER display. Normal system readings are 8.0 ± 0.5 µA for both switch positions; if not, accomplish steps c (1) and (2). (ART-1 is 4 µA and ART-2 is set for 8 µA.)

c. If the SERVICE METER reading is not as specified in step b, adjust balance resistor A1A2R62 and threshold resistor A1A2R59 as follows:

NOTE: Gain access to resistors by pulling the R/ACU drawer out until slide locks engage.

(1) Locate the Azimuth/ Elevation Amplifier circuit card assembly A1A2.

(2) Adjust the balance resistor R62 to equalize SERVICE METER readings for both auxiliary switch positions.

(3) Adjust the threshold resistor R59 to obtain a reading on the SERVICE METER for both auxiliary switch positions.

(4) Repeat the adjustment sequence until a normal reading is obtained on the SERVICE METER for both auxiliary switch positions.

NOTE: If after the alignment the pedestal creeps, adjust balance resistor R62 to eliminate creep. Verify by using the test 8 on the simulator and observe the digital display.

1.2.5 Azimuth Tachometer Gain Adjustment (A4R80 and A4R81)

a. Press to illuminate the STANDBY, NEAR AUTO TRACK MODE and AGC/MGC.

b. Locate and position switches A4S1-1 and A4S1-2 OFF (open).

NOTE: The MGC voltage is used as a variable input to the tachometer amplifier.

c. Connect a short clip lead jumper between A7-D (GAIN on test panel) and the junction of A4R79 and A4R83.

d. Set the DVM to DC scale and connect the positive lead to to A7-D and the negative lead to ground. Adjust MGC-GAIN control to achieve a DVM reading of +1.0 ± 0.05 Vdc. Remove the DVM.

e. Verify the NEAR AUTO TRACK MODE is illuminated. Connect the DVM between A4TP8 and ground. Adjust A4R80 to achieve a DVM reading of -0.6 ± 0.01 Vdc for the ART-1 and -1.1 ± 0.01 Vdc for the ART-2.

f. Press to illuminate the FAR AUTO TRACK MODE.

g. Verify that A7-D is still at +1.0 ± 0.05 Vdc level. If not, readjust MGC-GAIN control to achieve a DVM reading of 1.0 ± 0.05 Vdc. Remove DVM.

h. Connect the DVM between A4TP8 and ground. Adjust A4R81 to achieve a DVM reading of -8.5 Vdc for the ART- 1 and -4.7 ± 0.1 Vdc for the ART-2.

i. Verify that A7-D is still at +1.0 ± 0.05 Vdc. If not, repeat steps g and h.

j. Disconnect the clip lead jumper from A7-D.

k. Reposition switch A4S1-2 for ART-1 and A4S1-1 for ART-2 to the ON (closed) position. Verify switch settings with the settings in the following table.

Contacts (A4S1)	1	2	3	4
	TACH		FILTER	
Position (ART-1)	OFF	ON	OFF	ON
Position (ART-2)	ON	OFF	OFF	ON

l. Position SYSTEM POWER switch to OFF, and place the azimuth phase comparator circuit card assembly A4 into its nested position.

1.3 Elevation Alignment

1.3.1 Elevation Static Alignment

a. Raise the elevation phase comparator circuit card assembly A3 on the extender circuit card A11.

b. Position SYSTEM POWER switch to ON.

c. Repeat the Initial Setup procedure, section 1.1.1.

1.3.2 Elevation Tachometer Phase Null (A3R45) [ART-2 only]

a. Connect the oscilloscope to A3TP10.

b. While slewing in the elevation axis (up then down), adjust A3R45 until the best half-wave rectified waveforms are obtained.

1.3.3 Elevation Tachometer Null (A3R37) [ART-2 only]

a. Slew the antenna assembly in elevation to about 60 degrees. Remove the elevation housing top and side covers.

b. Press to illuminate the STANDBY. Verify that the motors stopped running. At the R/ACU, position SYSTEM POWER switch to OFF.

*****WARNING*****

The white wire removed in the next step carries 115 Vac. To prevent bodily injury, ensure the SYSTEM POWER switch is in the OFF position before disconnecting the wire.

c. At the elevation drive assembly, carefully remove the white wire from terminal 7. Cover the lead with tape to prevent it from shorting to ground.

d. At the R/ACU, position SYSTEM POWER switch to ON.

e. Press to extinguish STANDBY. Observe that only the azimuth motor is running.

f. Connect the oscilloscope between A3-AA (ART2-TAC on test panel) and ground.

g. Adjust A3R37 for a minimum 60 Hz signal (0.15 V p-p typical).

h. Connect the oscilloscope and DVM between A3TP10 and ground.

i. Adjust the elevation tachometer core for a null on the oscilloscope (0.1 V p-p typical).

j. Readjust A3R37 for the best null on the oscilloscope. Then readjust A3R37 for 0 Vdc on the DVM.

k. Press to illuminate STANDBY. Verify the azimuth motor stops running. At the R/ACU, position SYSTEM POWER switch to OFF.

l. At the elevation drive assembly, remove the tape from the end of the white wire and carefully secure the wire to terminal 7.

m. Install the elevation housing covers.

n. At R/ACU, position SYSTEM POWER switch to ON. Press to extinguish STANDBY. Verify that both drive motors are running.

1.3.4 Elevation Drive Current Idle Balance (A2R23 and A2R26)

a. Verify the MANUAL TRACK MODE is illuminated and STANDBY is extinguished.

b. Position the test selector switch to EL DRIVE.

c. Alternately, position the auxiliary test switch between UP/CW and DN/CCW while observing the SERVICE METER display. Normal system readings are 8.0 ± 0.5 µA for both switch positions; if not, accomplish steps c (1) and (2). (ART- 1 is 4 µA and ART-2 is set for 8 µA).

d. If the SERVICE METER reading is not as specified in step b, adjust balance resistor A1A2R26 and threshold resistor A1A2R23 as follows:

NOTE: Gain access to resistors by pulling the R/ACU drawer out until slide locks engage.

(1) Locate the Azimuth/Elevation Amplifier circuit card assembly A1A2.

(2) Adjust balance resistor R26 to equalize the SERVICE METER readings for both auxiliary switch positions.

(3) Adjust threshold resistor R23 to obtain reading on SERVICE METER for both auxiliary switch positions.

(4) Repeat the adjustment sequence until a normal reading is obtained on the SERVICE METER for both auxiliary switch positions.

NOTE: If after the alignment the pedestal creeps, adjust balance resistor R26 to eliminate creep. Verify by using the test 8 on the simulator, and observe the digital display.

1.3.5 Elevation Tachometer Gain Adjustment (A3R80 and A3R81)

a. Press to illuminate STANDBY, NEAR AUTO TRACK MODE, and AGC/MGC.

b. Locate and position switches A3S1-1 and A3S1-2 OFF (open).

NOTE: MGC voltage is used as a variable input to the tachometer amplifier.

c. Connect a short clip lead jumper between A7-D (on test panel) and the junction of A3R79 and A3R83.

d. Set the DVM to DC scale and connect it between the clip lead jumper to A7-D and ground.

e. Adjust the MGC GAIN control to achieve a DVM reading of +1.0 ±0.05 Vdc. Remove the DVM.

f. Verify the NEAR AUTO TRACK MODE is illuminated.

g. Connect the DVM between A3TP8 and ground.

h. Adjust A3R80 to achieve a DVM reading of -0.6 Vdc ± 0.01 for the ART-1 and -1.1 ±0.01 Vdc for the ART-2.

i. Press to illuminate FAR AUTO TRACK MODE.

j. Verify that A7-D is still at +1.0 ±0.05 Vdc level. If not, readjust MGC GAIN control to achieve a DVM reading of +1.0 ±0.05 Vdc. Remove DVM.

k. Connect the DVM between A3TP8 and ground. Adjust A3R81 to achieve a DVM reading of -8.5 ± 0.1 for the ART-1 and -4.7 ± 0.1 Vdc for the ART-2.

l. Verify that A7-D is still at +1.0 ±0.05 Vdc. If not, repeat steps j and k.

m. Disconnect the clip lead jumper from A7-D.

n. Reposition switch A3S1-2 for ART-1 and A3S1-1 for ART-2 to the ON (closed) position. Verify switch settings with the settings in the following table.

Contacts (A3S1)	1	2	3	4
	TACH		FILTER	
Position (ART-1)	OFF	ON	OFF	ON
Position (ART-2)	ON	OFF	OFF	ON

o. Position SYSTEM POWER switch to OFF, and place the elevation phase comparator circuit card assembly A3 into its nested position.

1.4 Active Alignments Using the Simulator

1.4.1 Video Amplifier Alignment (A14R36 and A5R10)

a. Repeat the Initial Setup procedure, section 1.1.1.

b. Connect the RF output of the Signal Generator to SIMULATOR IN (J1) at the RF Assembly.

c. Connect the AM input jack on the Signal Generator to the SIMULATOR OUT connector on the Pedestal Assembly.

d. Press [RCL] 112 [ENTER] to set the signal generator to 1680 MHz, @ -30 dBm.

e. Execute Test 2 on the simulator as follows:

(1) Press 2 on the simulator keypad (the 2 appears in the upper display).

(2) Press the ENT key (the 2 appears in the lower display).

(3) Press the EXC key (RUN appears in the upper display).

f. Set the DVM for AC scale and connect DVM and oscilloscope between A5TP2 and ground.

g. Press to illuminate STANDBY and OVERRIDE.

h. By hand, slowly slew the antenna assembly in azimuth, clockwise or counterclockwise, to achieve a DVM reading of 450 ±50 mv AC. If a DVM reading of 450 ±50 mv AC is unobtainable, adjust A14R36 counter-clockwise. This adjustment increases the Azimuth Simulator output gain.

i. Connect the DVM to A5TP3 and adjust A5R10 for a DVM reading of 350 ±10 mv AC. This sets the gain stage for the nominal gain of 0.78. (MAINTAIN 350 mv AC on A5TP3 and perform the Video Amplifier Phase Adjust, section 1.4.2.)

1.4.2 Video Amplifier Phase Adjustment (A5R16)

a. Position test selector switch to EL ERROR.

b. Adjust A5R16 for 0 µA, observed on SERVICE METER.

1.4.3 Azimuth Servo Amplifier Adjustment (A2R42)

a. On the SIMULATOR keyboard, press the CLR button three times to clear the display and then execute Test 2. Refer to section 1.4.1, step e.

b. Connect the DVM between A4TP2 and ground.

c. Press to extinguish STANDBY. Verify the MANUAL TRACK MODE is illuminated.

d. Slew the antenna assembly counterclockwise to achieve a reading of +1.0 Vdc on the DVM. (Clockwise will give a negative voltage reading.)

e. Press to illuminate the buttons in the following sequence: STANDBY, OVERRIDE, and NEAR AUTO TRACK MODE.

f. Connect the DVM between A2TP6 and ground, and adjust A2R42 to obtain a reading of -1.2 Vdc for the ART-1 and -1.9 Vdc for the ART-2.

1.4.4 Azimuth Simulator Gain Adjustment (A14R36)

a. Press to illuminate MANUAL TRACK MODE. Press to extinguish STANDBY and OVERRIDE.

b. Slew the antenna assembly clockwise about 10 degrees from its present position.

c. Press to illuminate the buttons in the following sequence: STANDBY, OVERRIDE, and NEAR AUTO TRACK MODE.

d. With the DVM still connected between A2TP6 and ground, adjust A14R36 to obtain a reading of ±12 Vdc or the maximum positive or negative reading.

1.4.5 Elevation Servo Amplifier Adjustment (A2R3)

a. On the SIMULATOR keypad, press the CLR button three times, and then execute Test # 2. Refer to section 1.4.1, step e.

b. Connect the DVM between A3TP2 and ground.

c. Press to illuminate MANUAL TRACK MODE. Press to extinguish STANDBY and OVERRIDE. Slew the antenna assembly DOWN to achieve a reading of +1.0 Vdc on the DVM. (UP will give a negative reading.)

d. Press to illuminate the buttons in the following sequence: STANDBY, OVERRIDE, and NEAR AUTO TRACK MODE.

e. Connect the DVM between A2TP2 and ground. Adjust A2R3 to obtain a reading of -1.2 Vdc for the ART-1 and -1.9 Vdc on the ART-2.

NOTE: Maintain test 2 for the next adjustment.

1.4.6 Elevation Simulator Gain Adjustment (A14R6)

a. Press to illuminate MANUAL TRACK MODE. Press to extinguish STANDBY and OVERRIDE.

b. Slew the antenna assembly approximately 10 degrees up from its present position.

c. Press to illuminate the buttons in the following sequence: STANDBY, OVERRIDE, and NEAR AUTO TRACK MODE.

d. With the DVM still connected between A2TP2 and ground, adjust A14R6 to obtain a reading of +12 Vdc.

e. Disconnect the Signal Generator from the RF Assembly.

1.5 Servo Amplifier Overload Adjustment (A2)

1.5.1 Overload Threshold (A2R82)

a. Position R/ACU SYSTEM POWER switch to OFF.

b. Remove the CAUTION cover from the Azimuth Servo Amplifier Module (A4) located on the left side of the R/ACU chassis - right unit.

c. Remove the wire from terminal 6 of the Azimuth Servo Amplifier Module.

d. Raise the Azimuth/Elevation circuit card assembly A2 on the extender circuit card assembly A11.

e. Position R/ACU SYSTEM POWER switch to ON.

f. Repeat the Initial Setup procedure, section 1.1.1.

g. Connect the DVM or oscilloscope input to the junction of A2R83 and A2R84, and adjust A2R82 (overload threshold) for an indicated voltage of 3.0 ± 0.3 Vdc.

1.5.2 Overload Timing (A2R95)

a. Connect a short clip lead jumper to the wire removed from terminal 6 in section 1.5.1, step c.

b. At this time, false alarms of OBSTRUCTION or OVERLOAD are possible. If necessary, press to extinguish OBSTRUCTION.

c. While observing the OVERLOAD indicator, connect the free end of the clip lead jumper to test point PS4TP2 (+5 V), and note the delay time for illumination of the OVERLOAD indicator.

d. Remove the clip lead from PS4TP2. Momentarily touch the clip lead to ground. Reset OVERLOAD by pressing the OBSTRUCTION button (reset switch).

e. Adjust A2R95 as necessary, while repeating steps b and c to obtain an overload delay time of 10 ± 3 seconds as measured from time of +5 V contact to illumination of OVERLOAD indicator.

f. Position the R/ACU SYSTEM POWER switch to OFF, and remove the clip lead from the R/ACU. Connect the wire to terminal 6 and install the CAUTION cover on the Azimuth Servo Amplifier A4.

g. Place Azimuth/Elevation Amplifier circuit card assembly A2 into its nested position.

h. Position R/ACU SYSTEM POWER switch to ON.

1.6 Safety Bar Test (ART-2 only)

a. With STANDBY extinguished and elevation and azimuth motors running, slew antenna assembly up or down to a position where the safety bar can be reached.

b. Apply pressure to the safety bar, in the direction of the pedestal; the elevation and azimuth motors should stop running, and the OBSTRUCTION indicator should illuminate.

c. Reset OVERLOAD by pressing the OBSTRUCTION button (reset switch); elevation and azimuth motors should start to run.

1.7 Reference Generator Alignment

a. Activate the on-site target antenna.

b. Repeat the Initial Setup procedure, section 1.1.1.

c. Point the antenna assembly at the target antenna. Verify the receiver locks on to 1680 MHz.

d. Manually slew the antenna assembly to maximize the received signal strength; use the SIGNAL LEVEL/FREQ meter to observe the signal strength.

1.7.1 Coarse Adjustment

a. Press MANUAL TRACK MODE to illuminate.

b. Slew the antenna to the approximate test target antenna angles.

c. Connect channel 1 of oscilloscope to A5TP1. Use AC coupling. Trigger on channel 1 input. Adjust the oscilloscope controls to display two cycles of the AM signal.

d. Slowly slew the antenna in azimuth for minimum peak-to-peak signal as viewed on the oscilloscope.

e. Slowly slew the antenna in elevation for minimum peak-to-peak signal as viewed on the oscilloscope.

f. Start simulator test 8 and note both the elevation and azimuth angles.

g. Slew the antenna 1 degree UP.

h. Slew the antenna 1 degree clockwise.

i. Observe the values for the elevation and azimuth errors on the service meter. Both error voltages should be negative and approximately equal in value (±10 ：A). This ensures the reference generator is not 180 degrees out of phase. If the error voltages are incorrect, adjust the reference generator.

j. Complete the phasing adjustment procedures, section 1.7.2.

1.7.2 Reference Generator Final Setting

a. Press to illuminate FAR AUTO TRACK MODE and lock system onto test target antenna.

b. Connect channel 1 of oscilloscope to A5TP1. Use AC coupling. Trigger on channel 1 input. Adjust the oscilloscope controls to display two cycles of the AM signal.

c. Press to illuminate MANUAL TRACK MODE.

d. Slowly slew the antenna in azimuth for minimum peak-to-peak signal as viewed on the oscilloscope.

e. Slowly slew the antenna in elevation for minimum peak-to-peak signal as viewed on the oscilloscope.

f. Start simulator test 8 and note both the elevation and azimuth angles.

g. Connect channel 2 of the oscilloscope to A5TP2. Use AC coupling.

h. Trigger on channel 1 input.

i. Adjust the oscilloscope controls to display both channels.

j. Move antenna 1 degree UP.

k. Observe the oscilloscope and adjust A5R16 so the signal at A5TP2 is in phase with A5TP1. This centers the adjustment of A5R16.

l. Set the service meter to AZ ERROR.

m. Set the DVM for DC and connect it across the terminals of the service meter. Using the DVM increases the accuracy of the phasing adjustment and enables the technician to adjust the reference generator while viewing the DVM.

n. Adjust the reference generator for 0 on the DVM.

o. Press to illuminate FAR AUTO TRACK MODE and let the system lock onto the test target antenna. Compare the angles displayed on the simulator to the angles noted in step f. They should be within 0.03 degrees. The dead zone in the far auto tracking mode is affected by the adjustment of A3R81 (elevation) and A4R81 (azimuth). Excessive dead zone in the near auto tracking mode indicates a defect in the system.

p. Press to illuminate MANUAL TRACK MODE.

q. Slew the antenna 2 degrees UP.

r. Adjust A5R16 for 0 on the DVM. This is the fine adjustment of the system phasing.

s. Press to illuminate FAR AUTO TRACK MODE and let the system lock onto the test target antenna.

t. Press to illuminate MANUAL TRACK MODE.

u. Move antenna 1 degree clockwise.

v. Set the service meter to EL ERROR. Verify the EL ERROR is less than 1.0 ∶A (1 division on the service meter).

w. Press to illuminate FAR AUTO TRACK MODE and let the system lock onto the test target antenna.

x. Press to illuminate MANUAL TRACK MODE.

y. Move the antenna 1 degree counterclockwise.

z. Verify the EL ERROR is less than 1.0 ∶A (1 division on the service meter). If the system cannot be phased to less than 1 division, the pylon may be defective.

NOTE: Incorrect system phasing will cause excessive interaction between channels and prevent acceptable RMS comparative values from being obtained.

aa. Remove both oscilloscope leads from A5.

bb. Remove the DVM.

1.7.3 Final Check

a. Point the antenna assembly at the target antenna and lock on the receiver in frequency and angle.

b. Slew the antenna assembly approximately 3 to 4 degrees clockwise and press the NEAR AUTO TRACK MODE button. Observe the antenna assembly reset response. It should be rapid with a small overshoot.

c. Repeat step b for counterclockwise up and down directions.

d. Slew the antenna assembly approximately 3 to 4 degrees clockwise and press the FAR AUTO TRACK MODE button. Observe the antenna assembly reset response. It should be smooth and slow, taking about 15 to 20 seconds to stabilize.

e. Repeat step d for counterclockwise, up and down directions.

f. At the MCU, repeat steps b through e, noting each final stabilized angle displayed on the Angle/Time Display. Calculate the reset deadband errors using the difference between the up and down, and clockwise and counterclockwise displays. Reset deadband error must be less than 0.03 degree.

g. If the error in the NEAR AUTO TRACK MODE is small but the error in the FAR AUTO TRACK MODE is excessive, reduce the FAR AUTO tachometer feedback by turning counterclockwise A3R81 for elevation and A4R81 for Azimuth to achieve proper deadband response in FAR AUTO TRACK MODE. Excessive deadband in NEAR AUTO TRACK MODE or instability (oscillation) in either mode indicates improper alignment or a system fault.

This concludes the tracking alignment procedure.

REPORT MAINTENANCE

Report maintenance on a WS Form A-26, Maintenance Record, according to instructions in Engineering Handbook No. 4 (EHB-4), Part 2, and Appendix J. A sample WS Form A-26 is attached. As an additional guide, refer to the table below.

Block #	Block Type	Information
5	Description	Perform Tracking Alignment Procedure I.A.W. ART-1/2 Maintenance Note 20, Rev A.
7	Equipment Code	ART1 or ART2 (as appropriate)
15	Comments	Performed Tracking Alignment Procedure I.A.W. ART1/2 Maintenance Note 20, Rev A.
17a	Mod. No.	M20

John McNulty
Chief, Maintenance, Logistics, and Acquisition Division

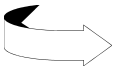
Attachment A - Marconi 2024 Memory Settings
Attachment B - WS Form A-26 Sample

ATTACHMENT A

Marconi 2024 Memory Settings

Perform the following signal generator parameter memory stores. The ART alignment refers to these memory settings to facilitate the signal generator setup for the receiver and tracking alignments. Reading the table from left to right, follow the instructions given below. Reference the Marconi Operating Manual for complete operating instructions.

Saving Power Up Settings						
To reset generator to factory settings 2	RCL	999	Hz ENTER			
Set to 1680 MHz 2	CARR FREQ	1680	MHz			
Enable internal pulse modulation 2	MENU	22	Hz ENTER	2		
Set to -60 dBm 2	RF LEVEL	-60	Hz ENTER			
Set to AM external 2	MENU	20	Hz ENTER	PREV or NEXT	**AM ext**	SELECT LOCAL
Set modulation source and AM depth of modulation 2	MENU	30	Hz ENTER	PREV or NEXT	**Ext:**	2
	MOD	SOURCE ON/OFF	**ON**	30	%	

Store settings 2	STO	100	Hz ENTER			
Storing power up settings 2	MENU	54	Hz ENTER	PREV or NEXT	**Power Up Choice**	1
	NEXT	**Recall memory**	100	Hz ENTER		
Storing AGC Alignment Settings						
Store 1655 MHz 2	CARR FREQ	1655	MHz	STO	101	Hz ENTER
Store 1670 MHz 2	CARR FREQ	1670	MHz	STO	102	Hz ENTER
	STO	0	Hz ENTER			
Store 1690 MHz 2	CARR FREQ	1690	MHz	STO	1	Hz ENTER
Recall 1680 MHz 2	RCL	100	Hz ENTER			
Store -74 dBm 2	RF LEVEL	-74	Hz ENTER	STO	103	Hz ENTER
Store -5 dBm 2	RF LEVEL	-5	Hz ENTER	STO	104	Hz ENTER

Store -100 dBm 2	RF LEVEL	-100	Hz ENTER	STO	105	Hz ENTER
Store -80 dBm 2	RF LEVEL	-80	Hz ENTER	STO	106	Hz ENTER
Store -104 dBm 2	RF LEVEL	-104	Hz ENTER	STO	107	Hz ENTER
Store -4 dBm 2	RF LEVEL	-4	Hz ENTER	STO	108	Hz ENTER
Storing AFC Alignment Settings						
Store 10.7 MHz at 6.2 dBm for a 1.6 - 1.8 V p-p output level 2	CARR FREQ	10.7	MHz	RF LEVEL	6.2	Hz ENTER
	STO	109	Hz ENTER			
Store 10.45 MHz 2	CARR FREQ	10.45	MHz	STO	110	Hz ENTER
	STO	2	Hz ENTER			
Store 10.95 MHz 2	CARR FREQ	10.95	MHz	STO	3	Hz ENTER

Storing MET Data Digitizer Settings						
Store 1680 MHz at -60 dBm, INT Pulse Mod ON at 100 Hz 2	RCL	100	Hz ENTER	MOD	MOD	**Pulse Mod INT OFF**
	SOURCE ON/OFF	**Pulse Mod INT ON**	MOD SOURCE	100	Hz ENTER	STO
	111	Hz ENTER				
Video Amplifier Alignment (A14R36 and A5R10)						
Store -30dBm 2	RCL	103	Hz ENTER	RF LEVEL	-30	Hz ENTER
	STO	112	Hz ENTER			

Routine Maintenance						
Store -50 dBm 2	RF LEVEL	-50	Hz ENTER	STO	115	Hz ENTER
Store -40 dBm 2	RF LEVEL	-40	Hz ENTER	STO	116	Hz ENTER
Store -30 dBm 2	RF LEVEL	-30	Hz ENTER	STO	117	Hz ENTER
Store 0.0 dBm 2	RF LEVEL	0	Hz ENTER	STO	118	Hz ENTER
Store 1680 MHz at -50 dBm, INT Pulse Mod ON at 200 Hz 2	RCL	115	Hz ENTER	SOURCE ON/OFF	MOD	MOD
	Pulse Mod INT OFF	SOURCE ON/OFF	**Pulse Mod INT ON**	MOD SOURCE	200	Hz ENTER
	STO	119	Hz ENTER			

ATTACHMENT B

WS FORM A-26 (4/94)

WS FORM A-26 (4/94)

U.S. DEPARTMENT OF COMMERCE
NATIONAL OCEANIC AND ATMOSPHERIC ADMINISTRATION
NATIONAL WEATHER SERVICE

ENGINEERING MANAGEMENT REPORTING SYSTEM
MAINTENANCE RECORD

Document Number: **G 49978**

General Information	1. Open Date	Time	2. Initials	3. Response Priority (check one)	4. Close Date	Time
	3 / 14 / 01	0900	JMM	○ Immediate ○ Low ○ Routine ☒ Not Applicable	3 / 14 / 01	1100

5. Description: **Perform Tracking Alignment Procedure I.A.W. Amendment 1 to ART1/2 Maintenance Note 20**

Equipment Information	6. Station ID	7. Equipment Code	8. Serial Number	9. TM	10. AT	11. How Mal.
	AMA	ART1	019	E	M	999

12. *EQUIPMENT OPERATIONAL STATUS TIMES*	a. **Fully Operational**	b. Logistics Delay	**Partly Operational**	c. All Other	d. Logistics Delay	**Not Operational**	e. All Other
							2:00

13. *Parts Failure Information*

Block #	a. ASN	b. NSN	c. TM	d. AT	e. How Mal.	f. Qty.	g. Maint. Hrs.
1							
2							
3							
4							
5							

14. *Work Load Information*

Type	Staff Hrs.
a. Routine	2:00
b. Non-routine	
c. Travel	
d. Misc.	
e. Overtime	

Miscellaneous Information	15. Maintenance Comments	16. Initials
	Performed Tracking Alignment Procedure I.A.W. Amendment 1 to ART1/2 Maintenance Note 20.	JMM

17. *SPECIAL PURPOSE REPORTING*	a. Mod. No.	b. Mod./Act./Deact.Date	c.	d.	e.
	M20	3/14/01			

18. *CONFIGURATION MGMT. REPORTING* (use as directed)	ASN	Vendor Part Number (New Part)	Serial Number (Old Part)	Serial Number (New Part)